

REMARKS

Claims 1-17, 26 and 28-37 are all the claims presently pending in the application. Applicants have amended claims 1, 10, and 11 to define the claimed invention more particularly.

Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-3, 7, 8, 10, 11, 13, 14, 16, 17, 30, 32, and 33 stand rejected under 35 U.S.C. §102(b) as being anticipated by Shimazawa (U.S. 6,123,781). Claims 4 and 5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Shimazawa and further in view of Fan, et al. (U.S. 4,863,877; hereinafter “Fan”). Claims 6, 12, 26, 28, and 34 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Shimazawa and further in view of Tuttle, et al. (U.S. Application Serial No. 2004/0040628 A1; hereinafter “Tuttle”). Claims 9, 10, 13-17, 29-33, and 35-37 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Shimazawa in view of Tuttle and further in view of IBM TDB NN 87044908 (hereinafter “IBM”).

Applicants respectfully traverse these rejections in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention of exemplary claim 1 provides a method of thermally treating a magnetic layer of a wafer including applying at least one local magnetic field to the magnetic layer obtained without making electrical contact to the wafer (e.g., see Application at page 7, lines 15-21). This combination of features allows for a fast and

local annealing of magnetic stacks (see Application at page 3, lines 20-21). Additionally, magnetic stacks using an exchange-biasing antiferromagnet such as PtMn can be reliably and efficiently annealed in a magnetic field after deposition, in order to align the pinning of the magnetic reference layer (see Application at page 4, lines 15-18).

II. THE RELATED ART REJECTIONS

A. The Shimazawa Reference

The Examiner alleges that Shimazawa teaches the claimed invention of claims 1-3, 7, 8, 10, 11, 13, 14, 16, 17, 30, 32, and 33. Applicants respectfully submit, however, that Shimazawa does not teach or suggest each feature of the claimed invention.

That is, Shimazawa does not teach or suggest, “*applying at least one local magnetic field to said magnetic layer obtained without making electrical contact to the wafer*”, as recited in exemplary claim 1 and similarly recited in exemplary claim 11.

Shimazawa is directed to a specific problem in magnetic recording head manufacturing. After the wafers have been prepared and annealed in field, the wafers need to be diced, first into bars and then into individual heads. This process of dicing can degrade the magnetic properties. Shimazawa teaches to re-anneal the cut-out bars or heads to recover the magnetic properties. Shimazawa re-anneals the bars or heads by passing a current through the head to generate both heat and magnetic field.

The Examiner alleges that the current passing through the head creates a local field and a local heating. Furthermore, the Examiner alleges that given the local field of Shimazawa, previously known rapid-thermal-annealing techniques could be applied to generate heat either globally or locally. The Examiner, however, is incorrect.

Shimazawa requires electrical contact to the wafer. This may be acceptable for recording heads because the process is essentially done. Electrical contact with the wafer, however, is not acceptable for MRAM wafers because the anneal is done after stack deposition and before the patterning and wiring is complete. Making electrical contact to the wafer usually involves some scratching of the surface. This would generate many particulates, which would negatively affect the final yield. That is, the resulting chip would probably be worthless.

The reason Shimazawa employs currents is that the heads need to be electrically connected to verify their functionality. Therefore, it is appropriate in Shimazawa to use this electrical connection to anneal the heads and then test again to check for improvement. Shimazawa, however, does not teach the use of **local heat and fields**. Indeed, the process of Shimazawa is just a by-product of the desired electrical feed back. In fact, all the local fields are in the same direction relative to the sample (e.g., as opposed to the claimed invention as recited in exemplary dependent claim 10).

Therefore, Applicants submit that Shimazawa does not teach or suggest each feature of the claimed invention. Accordingly, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

B. The Fan Reference

The Examiner alleges that one of ordinary skill in the art would have combined Fan with Shimazawa to render obvious the claimed invention of claims 4 and 5. Applicants respectfully submit, however, that, even if combined, the alleged combination of references would not teach or suggest each feature of the claimed invention.

That is, Applicants submit that claims 4 and 5 are allowable at least based on similar reasons to those set forth above with respect to claims 1-3, 7, 8, 10, 11, 13, 14, 16, 17, 30, 32, and 33.

Moreover, Applicants submit that Fan fails to make up the deficiencies of Shimazawa.

Indeed, Fan is not related to magnetic materials. Fan merely discloses that rapid-thermal annealing with annealing times of less than 10 seconds can be used. Fan, however, discloses rapid-thermal annealing for recrystallization of Group III-IV material (e.g., GaAs) following an ion-implantation step. Fan does not, however, address anneal times for magnetic materials.

Therefore, Applicants respectfully submit that these references, even if combined, would not teach or suggest each feature of the claimed invention. Accordingly, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

C. The Tuttle Reference

The Examiner alleges that one of ordinary skill in the art would have combined Tuttle with Shimazawa to render obvious the claimed invention of claims 6, 12, 26, 28, and 34. Applicants respectfully submit, however, that, even if combined, the alleged combination of references would not teach or suggest each feature of the claimed invention.

That is, Applicants submit that claims 6, 12, 26, 28, and 34 are allowable at least based on similar reasons to those set forth above with respect to claims 1-3, 7, 8, 10, 11, 13, 14, 16, 17, 30, 32, and 33.

Moreover, Applicants submit that Tuttle fails to make up the deficiencies of Shimazawa.

Indeed, Tuttle merely teaches annealing individual wafers in order to reduce the annealing time and in order to make it easier to generate a uniform field over the whole wafer. Tuttle discloses, “According to the known bulk process, the applied magnetic field is generated either by a large electromagnet or a large permanent magnet. Either way, a powerful magnet is necessary to provide the required uniform magnetic field over the large volume of wafers.” (e.g., see Tuttle at paragraph [0008]). Tuttle teaches applying a uniform field to the wafer. For example, Tuttle uses a Helmholtz coil, which is well known for generating uniform fields. Tuttle does not teach or suggest applying local fields to the wafer.

Therefore, Applicants respectfully submit that these references, even if combined, would not teach or suggest each feature of the claimed invention. Accordingly, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

D. The IBM Reference

The Examiner alleges that one of ordinary skill in the art would have combined IBM with Tuttle and Shimazawa to render obvious the claimed invention of claims 9, 10, 13-17, 29-33, and 35-37. Applicants respectfully submit, however, that, even if combined, the alleged combination of references would not teach or suggest each feature of the claimed invention.

That is, Applicants submit that claims 9, 10, 13-17, 29-33, and 35-37 are allowable at least based on similar reasons to those set forth above in sections A and C.

Moreover, Applicants submit that IBM fails to make up the deficiencies of Tuttle and Shimazawa.

Indeed, IBM merely discusses applying a laser at a series of spots on a recording head to stabilize the walls by changing the properties of the magnetic materials. There is no indication that a field is applied, and consequently there is no indication of changing the applied field from spot to spot.

Therefore, Applicants respectfully submit that these references, even if combined, would not teach or suggest each feature of the claimed invention. Accordingly, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-17, 26 and 28-37, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Assignee's Deposit Account No. 50-0510.

Respectfully Submitted,

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